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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,533	07/29/2003	Joachim Nuetzel	FIS920020132US1	1532

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EXAMINER	
MITCHELL, JAMES M	

ART UNIT	PAPER NUMBER
2813	

DATE MAILED: 12/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/604,533	NUETZEL ET AL.	
	Examiner	Art Unit	
	James M. Mitchell	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 July 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/29/03,8/6/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to the application filed July 29, 2004.

Claim Objections

Claims 8, 9, 11-13 and its dependents are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim should refer to an alternate claim, not itself. See MPEP § 608.01(n).

Accordingly, the claims 8, 9,11-15 have not been further treated on the merits.

Furthermore the numbering of claims should be in a numeric sequence; "c1" and "c2" are not a numbered sequence. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3, 5, 7 and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Ning et al. (U.S. 20020098676).

Ning (Fig 1-4; Par. 0026, 0027) discloses a device and method for forming an interconnect structure in a magnetic random access memory (MRAM) device, the method comprising: defining a magnetic stack layer (18) on a lower metallization level (210), said magnetic stack layer including a non- ferromagnetic layer disposed

magnetic layers, between a pair of ferro-magnetic stack layer ("stack layer comprise..bottom layers of magnetic materials, an insulating layer... a top layer ... of magnetic materials") defining a conductive hardmask (240) with a cap portion (i.e. part of 240) over said magnetic stack layer and lower metallization layer; and removing selected portions of said hardmask and said magnetic stack layer, thereby creating an array of magnetic tunnel junction (MTJ) stacks, said MTJ stacks including remaining portions of said magnetic stack layer and said hardmask (240, 244), wherein said hardmask forms a self aligning contact (defined by opening portion 250) between said magnetic stack layer and an upper metallization level (252) subsequently formed above said MTJ stacks; (cl. 2) further depositing an interlevel dielectric (ILD) layer (220; Fig 4) over said cap layer, and defining openings (250) for said upper metallization level in said ILD layer, wherein portions of said cap layer atop said MTJ stacks are used as an etch stop (i.e. cap removed but stack left unharmed; Fig 4-5); (cl. 5) hardmask comprises a conductive material selected from the group of: tantalum, tungsten, titanium, tantalum nitride, tungsten nitride, titanium nitride, and combinations comprising at least one of the foregoing (Par. 0027).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ning (U.S 2002/0098676) in combination with Ning '874 (U.S. 6,709,874).

The prior art does not appear to show the hard mask as silicon nitride or that its filling was through a damascene process.

Ning'874 utilizes silicon nitride as a hard mask (Col. 3, Lines 53-62) and filling through a damascene process (Col. 56-67).

It would have been obvious ot one of ordinary skill in the art to incorporate to form the hard mask of Ning from silicon nitride in order to provide a hard mask as reqiored by Ning ("the hard mask may comprise other materials..." ; Par. 0027) and to utilize a damascene process in the opening of Ning in order to provide a filling step that is required by Ning (Par. 0037).

Claims 1 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schwarzl et al. (U.S 6,351,408) in combination with Aratani (U.S. 20030234449).

Schwarzl (Fig 1, 2) discloses a magnetic random access memory (MRAM) device, comprising: an array of magnetic stack layers formed on a lower metallization level, said magnetic stack layer including a non- ferromagnetic layer (2) disposed between a pair of ferro- magnetic layers (1,3),

Schwarzl does not appear to show a conductive hardmask layer formed over said magnetic stack layer, wherein MTJ stacks created by the removal of selected portions of said hardmask layer and said magnetic stack layer and said hardmask layer forms a self aligning con- tact between said magnetic stack layer and an upper metallization level formed above said MTJ stacks or a method for forming an

interconnect structure in a magnetic random access memory (MRAM) device, the method comprising: defining a conductive hardmask with a cap portion over said magnetic stack layer and lower metallization layer; and removing selected portions of said hardmask and said magnetic stack layer, thereby creating an array of magnetic tunnel junction (MTJ) stacks, said MTJ stacks including remaining portions of said magnetic stack layer and said hardmask , wherein said hardmask forms a self aligning contact between said magnetic stack layer and an upper metallization level subsequently formed above said MTJ stacks.

Aratani (Fig 3, 4A-7B) utilizes a method for forming an interconnect structure in a magnetic random access memory (MRAM) device, the method comprising: defining a stack layer 12a,13a,14a) on a lower metallization level (11a), defining a conductive hardmask (15a) with a cap portion (i.e. part of 240) over said stack layer and lower metallization layer; and removing selected portions of said hardmask and said stack layer (Fig 6A), said stacks including remaining portions of said stack layer and said hardmask (15a), wherein said hardmask forms a self aligning contact between said magnetic stack layer and an upper metallization level (18a) subsequently formed above said stacks).

It would have been obvious to incorporate the method of Arantani in order to form a magnetic memory device as taught by Aratani (Par. 0004) and as required by Schwarzl (Abstract).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James M. Mitchell whose telephone number is (571) 272-1931. The examiner can normally be reached on M-F 8:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jmm
December 12, 2004

CARL WHITEHEAD, JR.
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